THE AMERICAN ARCHITECT AND BUILDING NEWS.

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BOSTON, JUNE 7, 1879.

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THE Chicago Custom-House Trial drags slowly along as we write. One or two supplementary witnesses called in by the Government have failed to offer any testimony of significance in the prosecution. The testimony of the defense has been occupied with maintaining the good character of the defendants, or impeaching that of the witnesses for the prosecution, and of rebutting as far as might be the complaints against the stone of the building. It was in evidence that the stone suffered from being set in the building before it was properly seasoned as well as from want of proper protection after setting, and the point was made on behalf of the contractor Mueller, that he had been forced against his judgment by the pressure of the Supervising Architect, Mr. Mullett, to furnish and cut it while it was yet green and its final behavior undetermined; also that while work on the building was interrupted during the investigations of 1875, he had asked permission to go on quarrying stone for the building in order that it might be seasoning for use, which was not allowed. A former superintendent of the Supervising Architect's office, Mr. Oakshott, who had been called upon once or twice to inspect the building during its progress, testified that much injury had probably been done to the building by setting the stone, which was done unskilfully, and in such a way as to expose it to deterioration. Other witnesses went further in this direction, declaring that the stone was so badly set as to admit water into the joints, bringing to the surface stains that would not otherwise have shown. Some declared that the building had seen its worst days and would improve from year to year as the stone got thoroughly seasoned; and some went so far as to declare that it was already the finest building that had been built of sandstone. Another point raised was that the stone having been accepted in the rough by the Government according to its contracts, before its quality could be fully seen, it was not until it had been cut at a large expense that many of its defects became visible, and then it was a question of sacrifice by throwing it away, cutting and all, or of patching and retaining it in its imperfection, the inspectors being especially notified that since the loss was the Government's they should be cautious in rejecting such stone. The contractor Mueller, testifying in his own behalf, supported these allegations, declaring that he had tried to put his best stone into the building that it might be a monument to himself. He further testified that instead of enriching himself by his contract, he had embarrassed himself, having expended large sums in plans for its execution and suffered greatly from delays and interruptions of the work, which with the costly and vexatious lawsuits that it had brought had actually impoverished him. In answer to questions of the prosecuting attorney whether his impoverishment did not come from having to divide with his confederates, he denied this utterly, but claimed that efforts had been made to blackmail him, notably by one Hibbard, who had brought suit for payment of fifteen cents per foot on all the stone he furnished for the building.

A CORRESPONDENT has sent us a copy of a rather remarkable sheet of "Instructions to Architects," offered by the Board of Regents of the University of Michigan. It bears the subtitle "Designs for a Museum Building for the University of Michigan," saying that designs are to be submitted under motto, and will be received until noon of June 23, and adds that the Regents reserve the right to reject all designs. Further than this there is no mention of any terms of competition. Architects are instructed to furnish four elevations, plans of each floor and roof, with two sections at right angles, all on the scale of four feet to the inch, and enough full-sized working drawings to explain the construction of their building. They are also to furnish specifications, with schedules of quantities and prices, sufficiently full to show the mode of construction and cost of completion, even to plumbing, gas-piping, and steam-piping, and they are expected to guarantee the execution of their designs for the limit of cost fixed by the committee. Instructions that would help in planning the sort of building that the Regents want are conspicuously absent, the only indications of what is wanted being in the requirements that the building shall be fire-proof, with floors of brick and iron; that it shall contain ten thousand feet of floor space, and cost not more than thirty thousand dollars; and that it is to be used exclusively for scientific collections. There is no hint of the kind, size, or subdivision of the collections, nor of the manner in which the building is to be adapted to them, nor of the number of rooms, nor of the amount of the plumbing or gas or steam piping for which the architect is to furnish and guarantee an estimate. The programme is, in short, one which would do for a school exercise, but not such as we should expect from a body of men who knew what they wanted and what they could expect. Yet it comes from the Regents of the principal university of the West, and concerns a particular kind of building for a specific use of which they, and they only, might be expected to know exactly the requirements.

IT is worth while to consider what this sheet invites, and what it offers in return, because there is a presumption, from the position of its authors, that they are more intelligent and considerate than the average building committee. It invites — if it can be said to invite anything — from architects who may respond to it a study of a design for a special use, — a use which it may be presumed is new to them, and of which the requisites are unknown to them, since they are apparently unknown even to the persons who are to use the building. Their study must be careful and minute, for they are to guarantee the cost of their buildings. They are instructed to furnish each a dozen sheets of working drawings, with specification, bills of quantities, and price-lists, which have got to be prepared with a great deal of care. These things, if they are well and thoroughly done, will make an expense for draughtsmen's and clerical labor of probably not less than two hundred and fifty dollars, apart from the labor and skill of the architect who designs them, which ought to count for twice as much more. In return for this pre-umable expense of money and labor the programme offers really nothing. It implies only that if any one of the architects who are expected to answer it is lucky enough to please the Regents he will have a chance of becoming the architect of their building under the unreasonable and unprofessional condition that he guarantees the cost of it, but the circular takes pains to say that this may not happen. It implies that the Regents expect to get plans from architects, for they would not issue such instructions for no purpose. One might argue, indeed, that they expected to be beset by architects, and had issued these instructions to repel as many as possible, and relieve themselves of an *embarras de richesses*. But it is probably issued in good faith, with the expectation that it will attract designs, or rather perhaps with the feeling that there is a fatal attraction in every remote chance of a "job," even a small one, — for this is not one of the prizes of the profession, — that such instructions cannot neutralize. There is an attraction, no doubt; but it is one to which it is rather perilous to appeal. The men in the profession to whom a judicious client would naturally turn for work of importance are not accessible to it. Those to whose services experience has given value, who are too conscientious to slight their work, and whose labor is too valuable to be wasted, are in fact likely to be pretty effectually deterred by such a manifesto. Its appeal will rather be to the unemployed and the irresponsible, the struggling beginner, or the needy adventurer of the profession, and we cannot help wondering that its projectors should expect to attract others.

IT is a good deal the habit of architects to complain of the want of consideration shown them by building committees, and although the case we have described above is an extreme one, it is true that such committees are not apt to show much respect for the profession as a profession, nor any high estimate of its

services. They treat it in fact not so much as a profession whose best service they would labor to secure as one whose attendance they can always command, or even against whose officiousness they feel it necessary to be on their guard. That under these circumstances they should rate an architect's time and labor as of much value is not to be expected. Men do not value what they can have for the asking, and it makes no great difference if instead of mere asking they have only to offer the inducement of a small chance of employment. Eagerness spoils its own market, and if architects are conspicuously anxious to offer their wares whenever there appears a possibility of acceptance, it is no wonder that they are cheapened; nor is it strange that inexpert customers like committees do not stop to inquire very carefully whether the wares that are temptingly displayed are the best they could get or not. If this condition of things is encouraged mainly by inferior practitioners, it is not altogether so, for the speculating propensity is contagious, and many of the better men in the profession are inconsiderate enough to confound themselves now and then with those of a lower grade, and lend a hand in competitions that are damaging to architects. It is of no use then for architects to relegate the responsibility to committees, and rail, like the disappointed architects in the Indiana State-House competition, at the treatment that may be given to them or their work. If they offer their cheek to the smiter, the merest school-boy pluck should teach them to refrain from whimpering when they feel the smart of the blow. It is idle to expect outside persons to charge themselves with upholding the dignity or exalting the records of our profession. It is not in nature that any committee should set a high value on the services of those whom it sees hanging on its favor, ready to work laboriously and long for the mere chance of being the lucky one to get some compensation; nor when any considerable number of the profession yield themselves to contemptuous handling need we expect that committees will be very exact to discriminate the inferiors who submit from the superiors who resist.

The Interoceanic Canal Congress has ended its sessions, and came to a conclusion that was altogether unexpected, at least to the friends of the canal on this side the ocean. The discussions had, as we said last week, narrowed to the question of advantage between some short and direct sea-level route to be achieved only by tunnelling through the mountain ridge, and a longer high-level route, avoiding the tunnel and crossing the divide by more or fewer locks; the first system being difficult and costly in construction but quick and cheap in transit, the second long and troublesome in operation but much cheaper in construction; the first the system favored by the French delegates, under the lead of M. de Lesseps and Lieutenant Wyse, the second that of the American delegates. When we last wrote it was clear that the report of the Committee on Technique, whose figures, by the way, appear to have been wrongly quoted, together with Sir John Hawkshaw's argument, had given a death-blow to the San Miguel scheme of Lieutenant Wyse and M. de Lesseps, and the report of the New York *Herald*, the only account of any completeness that has yet been received here, encouraged Americans to believe that one of the American routes would be selected. But the French engineers appear to have urged their ideas vigorously upon the Congress, under pressure of its appointed adjournment, and, giving up their San Miguel project as defeated, to have united on a modification of the Panama route, favored and perhaps suggested (on the spur of the moment, the *Herald* correspondent intimates) by Lieutenant Wyse. To this plan the Committee on Technique was induced to give its support, offering in the last hours of the Congress resolutions which recommended that the sea-level route from Colon to Panama be adopted. These resolutions were adopted unhesitatingly by the Congress, with hardly any dissenting votes; but the American delegates, who had been so taken aback by the unexpected turn of affairs as to be unable to offer any effectual opposition in debate, refused to take part in the final vote.

This rejection of the American projects, although it was coupled with many compliments to the American engineers, seems to have annoyed our delegates greatly, and has been received by newspapers on this side as if it were a national affront. The *Herald* thinks that Americans will not tamely acquiesce in such a judgment, and that it is with America alone that the final selection of an interoceanic canal route must rest. The *Tribune* does not expect Americans to view with composure the decision of the Congress, and reminding them that the scheme is substantially that proposed thirty years ago "by a needy adventurer, in London, named Louis Napoleon," and was pressed upon the Congress by another member of the Bonaparte family, thinks American investors "will not be likely to forget the slight which has been put upon American engineers at Paris." Al this strikes us as curiously beside the mark. The French theory has, to be sure, in a purely advisory congress, carried the day against the American. The French engineers may or may not have been moved by pride of country or partisan spirit; but the questions at issue are questions of engineering and of business, with which pride of country has really nothing to do. The reports of the *Herald*, though voluminous and intelligent, are written with too much patriotic *animus* to give any clear idea of the general feeling of the Congress. The Congress, however, was a large body convened from a great many nations; its all but unanimous final vote of seventy-four to eight can hardly be attributed to partisanship, but shows that the theory of a short sea-level canal, for all its cost, was decidedly approved. In a general view this seems a reasonable approval, and it matters nothing by whom the theory was brought forward. A ship canal, like a great through railroad, is a bold and expensive device for an enormous ultimate saving of time and labor, and is one of the things in which half-way measures are likely to be unsatisfactory. So far as the United States has an interest in this one, different from that of other nations, it is in saving coast distance by a canal farther north. But the Tehuantepec route, which alone meets this condition, would require one hundred and twenty locks and a twelve days' transit. It was not thought worth while to make estimates of its cost, nor did the Americans advocate it. Among the other routes the difference in remoteness is so unimportant that with the Americans the next favorite to the Nicaraguan, which is nearest, was Selfridge's Napipi route, which is the most remote. The time of transit computed was four days and a half by Nicaragua, three by the Napipi, and one and a half by Panama. A day's sailing through locks in a canal, we may remember, is a very different thing in the way of cost from a day in a sea voyage. As Americans, or as cosmopolitans, we may believe with comfort that when it comes to building the canal, in which the whole world has an interest, its location will be determined, not by an advisory congress, nor by patriotic pride, nor by boyish resentments; but by the enterprise and sagacity of capitalists and the skill of engineers.

The Bennington Battle Monument Association goes about its work in a way that may be commended as in some respects exemplary to other associations which have monuments to build. It has decided, in the first place, that it will not begin building until it has the money on hand to finish its work. It has received grants of money from the three States whose forces were concerned in the battle, Vermont having contributed fifteen thousand dollars, Massachusetts half as much, and New Hampshire five thousand. It is hoped to raise as much more by private subscription, bringing the whole amount up to seventy-five thousand dollars, of which at present something like forty thousand is secured, we are told, including the state grants. In the mean time the Association wisely refrains from committing itself in haste to any design, and has voted that none shall be accepted which has not received the unanimous vote of the directors. How easy it may prove to secure such unanimity remains to be seen, but the Association will undoubtedly find its account in its policy of a deliberate choice. We have more than once had occasion to lament the ill success of American public monuments, and this ill success is due to nothing more than to haste in selecting designs. A design is easier to get than the money, and is thought, moreover, to be an admirable appliance for raising it. One is therefore selected, commonly with very little consideration or effort at enlightenment, as soon as an association is formed, and a picture of it is hawked about in search of subscriptions. This works badly in more ways than one. The design thus hastily chosen is very likely, like that of the Washington Monument, to be a mortal incubus on the scheme. At the best it is apt to become stale and discredited in the effigy long before there is opportunity to embody it, and when interest in the subscription flags there is no new interest to fall back on. But the main danger is in the choice. To get a good design for a monument, in our time and country, is not an easy thing: if the choice is made hastily, it is pretty sure to be made badly; if it is made with painstaking deliberation, there is, at least, good opportunity to sift out unsuitable designs, and a chance for the employment

of expert counsel, without which it is very easy for the inexperienced to go astray. We may trust that the caution of the Bennington Association will save theirs from the too common fate of such enterprises, that of building a monument for which nobody cares when it is finished.

ON THE RELATION OF ARCHITECTURE TO UNDERWRITING.[1] II.

SHEET metal in all forms should be sparingly used on first-class fire-proof structures. The principal uses made of it for constructive and fire-protecting purposes are in floor arches, as before mentioned, lathing to support plaster, and for roof coverings. Lathing with sheet-iron is not used as much as formerly. If intended as a support for plastering, which is calculated to do any service as a protection against fire, it is open to this objection: the absorption of enough heat through the plastering to expand it to the least degree is liable to cause undulations, which will throw off the rigid and brittle plastering. It is also liable to decay through the action of sulphate of lime in gauged mortar, and it admits spaces, which fire may traverse, behind the plastering. Sheet-iron roofing is valuable only as a weather covering, and should be used only over a roof which is thoroughly fire-proof.

When used alone to cover the spaces between purlins it will resist fire neither from within nor from without. Sheet-iron used as a covering for ceilings or partitions has little or no value as a fire-resisting material. It readily conducts heat, and it is almost impossible to secure it so that it will not crumple and become disengaged. Sheet metal used for decorative purposes in cornices and exterior appendages is always destructible with slight heat. It will often lose its proper form from the radiated heat of a fire on the opposite side of the street.

As a general principle it may be assumed that the only building materials that will resist fire sufficiently to protect the construction of a building are those which are solid in their nature and at the same time porous. Porosity gives the non-conducting property and toughness or resistance to fracture. The degree in which porous bodies act as non-conductors depends upon their thickness. All brittle materials and all natural stones are unreliable as fire resisters.

I have now given a brief outline of the qualities essential to a fire-proof building of the first class, passing over many important details. It will be remembered, I assume, that common bricks were to be taken as the standard of fire-proof material for all practical purposes. Lest I may be misunderstood, allow me to add that there is no standard of absolute security under all circumstances. Mr. Schumann, in the paper above referred to, very truly says: "Warehouses, when stored with inflammable matter, even if constructed entirely of brick, but without precautionary subdividing walls forming compartments, will succumb to the heat by reason of the great expansion causing a movement of the walls and ultimate collapse of the floor arches." This is an extreme case, and the proof of it may be seen in every pottery-kiln, which is banded with iron, because, though lined with fire-bricks, it would otherwise burst asunder at every firing.

It may be added that all finishing materials used in such a fire-proof building are liable to destruction, whether they be of wood, metal, or plaster, by reason of the burning of contents; the most that can be attained by the best known systems of fire-proofing — and this is the main thing after all — being the preservation of the constructive portions of a building. Hence all such buildings are subjects for insurance to a limited extent.

The underwriter may possibly be able after considering these suggestions to detect defects in fire-proofing in so-called fire-proof buildings, which will enable him to determine if there is any liability to a greater amount of loss than could be possible in the finishing parts alone. If there is [not], he can reasonably assume that the building is insurable for the greater part of its value. As a general thing any failure in construction in a fire-proof building results in greater loss from a downfall of any part than in one not fire-proof. This is because of the great weight of materials employed, and the greater expense in making repairs.

I will now proceed to make some observations on fire-proof buildings of the second class. These have before been defined as those in which the materials of construction are combustible, but protected from the action of fire so as to become practically fire-proof. This is one of the most important problems for the modern architect to solve, as it involves the art of economic building. The principles involved are the same in both. The object is to limit the cost of the work as far as possible.

Two systems may be followed. One is found in the use of *heavy wood* for all interior constructions, and the avoidance of all concealed spaces which fire may traverse unseen. In such buildings all that is sought is the best facility for quenching a fire before it has had time to materially weaken the structure. Still, a fire in such a building, even if extinguished in its incipient stages, will cause so much damage that many of the heaviest constructional parts will have to be renewed in repairing damages. Such is the system of building sought to be enforced in factories by the mutual insurance companies of Massachusetts and Rhode Island. As the generality of buildings require an interior finish different from these, it is not always practicable to carry out such a system of construction in buildings other than factories, and it is better to combine the interior finish, which is usually plaster, with such fire-resisting adjuncts as may be necessary, in order that the result may be a building in which all the materials of construction are thoroughly protected from the ravages of fire.

It is assumed that in such a structure the same considerations will prevail with regard to the construction of walls, as have been described for buildings of the first class; the only difference being that lighter walls may be used than in a building the very weight of whose materials themselves demands stronger supports. But in warehouses or stores having very long boundary or party walls, a system of internal or external buttressing should be used in lieu of the support usually given by intersecting walls. A convenient opportunity for such buttressing may be found in the building of flues. As a rule the brickwork should not be diminished by the introduction of flues, but an amount equal to that displaced should be disposed on each side of a flue. By this means a natural buttress may be obtained. I adopted this rule while building in Chicago since the great fire, and in one of my buildings which was burned the importance of it was demonstrated; for in this case the walls of a six-story warehouse, with brick cornice, remained intact after the whole interior had been burned out.

It is assumed that the floor beams will be of wood, and as in the case of iron beams, the problem is how to construct a fire-proof ceiling and floor on such a frame-work. The ceiling is the most important part requiring protection, inasmuch as it is exposed to the greater heat, and should resist the natural progress of fire. Floors also require less protection, because the first water thrown into a building will spread over the floors, and there remain until it leaks away or evaporates.

To fill solid the spaces between the beams is objectionable for two reasons: (1) it accumulates too much weight, and (2) it induces danger from decay in the timber. There must be a ceiling and a floor. The ceiling must keep the fire from the beams, and it must be strong enough to carry any weight of water which might fill the space between it and the flooring. Iron laths are expensive, and liable to decay, being made of sheet-iron. Wires are less destructible than sheet-iron, because it is necessary to use wires having more body of metal in them than in the sheet iron that would be used for lath. Wires as a support for plastering may be used in two ways, either woven or strung. It has been found very inconvenient to set up false board ceilings under wires and then fill in from above with mortar, for the reason that the process requires the construction of ceilings before the floors are laid; and therefore it is better to apply the mortar from below. One advantage of wire-lathing over any other is that any desired amount of mortar may be forced through the meshes and above the wires. The amount necessary for thorough fire-proofing is not less than one inch. Two subsequent coats of mortar for finishing will add one half inch, making the full thickness of mortar one and a half inches.

The only other method of constructing economical fire-proof ceilings that I would recommend is found in the various forms of hollow slabs of fire-resisting material, secured to the beams by counter-sunk fastenings, and put together with mortar joints. Those made from one and a half to two inches in thickness, of lime of Teil, plaster and furnace slag in proper proportions, are the best in use. The plastering under such a ceiling adds one half inch to the thickness of fire-resisting material. The best method of deafening floors for fire-protection is, first, to lay a common floor of inch boards on top of the beams, then to nail strips one inch square on top of the boards and over the beams; then to fill the spaces between the strips with one inch of brown mortar; then to take up the strips and fill the spaces thus left with more mortar after the first mortar has dried. The upper floor may then be nailed through the fresh mortar and lower flooring, into the beams, with extra long nails. I have no other system of deafening to recommend. Other systems may be desirable when no dependence is placed on the ceilings to resist fire, but I do not suppose such a contingency to exist, as a proper ceiling should stop the ascent of the fire, and not the deafening. The edges of all floor openings, called aprons, should be treated in the same manner as ceilings.

Roofs may be protected inside and outside in the same manner as floors; but a better method for roofs is to omit the upper course of boards. In such cases the best deafening or fire-resisting material is porous tiles, one inch thick and six inches square, bedded in mortar and nailed to the boards (for all porous tiles can be nailed). The roof covering may be of Portland cement plastering, but if it be of tiles, slate, metal, or composition of any kind, it may be fastened to the tiles the same as if they were boards. This is an especially valuable process for mansard roofs. But mansard roofs should have a further protection, and that is best obtained by filling the spaces between the rafters with hollow blocks of porous concrete or clay, and plastering the whole interior surface. Where this filling is used, boarding is not necessary, and the course of porous tiles can be laid directly on the filling, thus making a uniform covering outside of the rafters, to which the weather roof may be applied.

Considering next in order the more complicated system of interior construction, that in which columns and girders may be required, the problem can be solved with different degrees of safety in the follow-

[1] A paper read before the New York State Association of Supervising and Adjusting Insurance Agents, at Syracuse, May 20, 1879, by Mr. P. B. Wight, architect.

ing ways: By the use of heavy oak columns and heavy oak girders. I say *oak* because it burns more slowly than any other accessible wood. But to insure safety with wood alone it is necessary to use a superfluity of it, to cover the loss of strength caused by the gradual destruction of the outer surface. For heavy loads wooden posts are not desirable, as enormous dimensions are often required when comparatively small sizes of iron would do the work. This is oftener the case with posts than with girders. The next best method for columns and girders is to use combination columns of cast-iron and oak, and combination girders of wrought-iron and oak. In both cases the iron is on the interior and the oak is on the exterior. The slow-burning and non-conducting properties of oak afford the necessary protection to the iron. The iron and oak must be firmly secured together. The best method of doing this, in the case of columns, is to make the casting with flanges radiating from a common centre, and to fill between the flanges with gores of oak which project beyond them, the joints over the iron being filled with plaster, and covered with sheet-iron strips. There are various ways of securing the gores to the iron interiors. Girders may be made by taking an iron I-beam and placing on each side and on the bottom a beam of oak. These beams should be worked to fit solidly against the iron, and should be secured to it by bolts. Such a system of construction readily admits of repairs in case a fire has occurred; for while, when solid timber is used, it is necessary to replace the columns and girders and resort to shoring to hold up the rest of the work, with this system it is only necessary to renew the wooden covering.

If a plaster-finish is required for the whole interior, and a more elaborate style of decoration is sought, it is best to plaster the girders upon porous tiles which have been first secured to them by nails, and to use the same kind of columns as those described for first-class fire-proof structures, which admit of a hard plaster or polished surface.

Interior partitions may be formed of four-inch studs placed two feet apart, filled in with brick and plastered directly on the brick, so as to cover the studs on both sides. But it is better, and little more expensive, to use the hollow fire-proof blocks described for first-class buildings. It is assumed that wherever possible interior partitions will be carried up from the foundations with solid brickwork. All columns and girders, carrying interior brick walls, should be of iron, encased and protected as above described. Wooden furring strips for exterior walls should not be used, but all walls exposed to dampness should be covered with porous tiles on the inside and plastered on the tiles. Interior wooden trusses and trussed roofs should be treated in the same manner as girders.

The possibility of destruction, in such a building as I have described, will be confined to the finishing materials employed, and its extent will depend upon the quantity of the destructible finishing materials. The remarks before made on this subject with reference to buildings of the first class will apply with equal propriety to the second class. It is therefore important that the amount of combustible material introduced in the finishing of such a structure should be severely restricted. This applies especially to the finish around windows. There is no necessity of having any wooden finish around the interiors of windows in business buildings, as plastering can be applied directly to the brick jambs and soffits, and inside sills may be of iron or slate. The box frames for window sashes, as usually made, can always be used for the attachment of inside blinds or shutters.

There are very few business buildings now constructed, in which the system of fire protection I have last described cannot be carried out. The attendant expense will not be great compared with the results attained. Every process mentioned is marketable and attainable throughout the whole country, and all are in use to a greater or less degree.

THE ILLUSTRATIONS.

HOUSE FOR G. H. VAN VLECK, ESQ., BUFFALO, N. Y. MR. M. E. BEEBE, ARCHITECT, BUFFALO.

This house is now building on Delaware Avenue. It is built of brick relieved with the Hulberton brown-stone, and will cost, when completed, $30,000.

COMPETITIVE DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK, N. Y. MESSRS. McKIM, MEAD & BIGELOW, ARCHITECTS, NEW YORK.

We regret that space does not allow us to show more clearly the arrangement of the various *entresol* stories which form so important a feature of this design: the height of the library and dining-room, twenty-five feet, allowing in the same height the introduction of stories fifteen feet high, with *entresols* ten feet high, as shown in one of the sections. The buil ling would have a frontage of eighty-four feet on Fifth Avenue, and of one hundred and fifty-two feet on Thirty-ninth Street.

The Inland Algerian Sea. — Captain Roudaire reports that fresh water is met with at a depth of thirteen feet below the surface of the isthmus of Gabés, even at the points where this is highest above the level of the sea. Two or three borings have been continued for some thirty feet below this depth, but nothing but sand and marly clays have been met with. Arab labor is plenty at the rate of eighteen cents a day.

YOUNG'S TOWN AND COUNTRY MANSIONS.

This book[1] contains thirty photo-lithographic plates showing various designs for dwelling-houses small and great. They are about equally divided between what the author calls Old English, and the other styles which he enumerates on his title-page. The Old English designs have the picturesque and rather vigorous manner of those in the author's previous book of Picturesque Architectural Studies, which has gained popularity in this country. Broken and gabled roofs, broad mullioned windows, turrets, bow-windows, high chimneys, and low porches are their materials. In the other designs, in the so-called Queen Anne, Classic, Adam's Jacobean, Louis XVI., and other styles, among which we will not attempt to discriminate too curiously, we miss a certain breadth and firmer handling which we find in the first. This indeed is only one more indication of what we often notice, that the ordinary English designer does not improve his chance of success when he steps out of the vernacular Gothic, in one form or another of which his better work is done, into any variation of classic style. We may however distinguish here the design for new houses in Kensington, which has much more elegance of distribution and property of detail than the rest.

The text of the book, which concerns itself very practically with the arrangement and construction of houses, and also the plans which it illustrates, are modelled of course on English habits, and therefore are more or less inapplicable to American wants. But certain habits in English planning which are fairly represented here deserve attention and will be found interesting on this side the water. Moreover, the glimpse it gives of English thoroughness of study in planning, from its own point of view, and of care in construction, makes it worth the reading of many American architects and of other persons who addict themselves to the planning of houses, while the effect upon clients of reading it might be far from unwholesome. It contains many practical suggestions too which will have their use to such people, expressed without literary art, but with conciseness and point. One noticeable characteristic of these, and of other English houses, is the amplitude with which they are planned, in contrast with the contracted stinginess which we see in most American houses, even those which are expensively finished. The rooms intended for company use are planned with an air of elegance and space which to American interiors is almost wholly wanting. Another point is the grouping of the rooms, the development and careful separation of the servants' quarters, things of which American planning, which seeks economy of space and distances at the expense of most other comforts, is apt to be neglectful. The walling off of a kitchen yard, even in a suburban house, is a thing we might learn to practise with much advantage of neatness. On the other hand, some peculiarities of English planning which strike an American as odd are here prominent. There is lack of rooms arranged *en suite*, except drawing-rooms, a curious impatience of symmetry in the rooms themselves, and marked insistance on nooks, corners, and bow-windows, in season and out of season. The habit of lighting rooms from one side only, though two may be exposed, is characteristically English, and lends itself to picturesque effect within, but would be intolerable in any American house which is to be occupied through the summer. In some of the city houses here shown there is a crowding which is quite up to the American standard or even beyond it. The householder, for instance, who among us should try to cram her servants into such quarters as are provided in the mansions in Cadogan Square, or in the Earl of Cadogan's own residence, would arouse an unquenchable rebellion, even if inspectors of buildings did not interfere. Nor would American tenants be attracted by the arrangement of the mansions just noticed, where the kitchen, scullery, and servants'-hall below, and the great dining-room and water-closet beside it above, have their only windows opening fraternally on a small interior well of about six feet by twelve; and where the gentlemen's sitting-room divides its windows between the well which lights the scullery, and a close court ten feet square upon which opens also a window of the stable. We have not consulted plans enough of English city mansions to judge how far such arrangements as these are habitual; but we notice that this free-and-easy relation of the stable is echoed in the plan for another city house of some pretension.

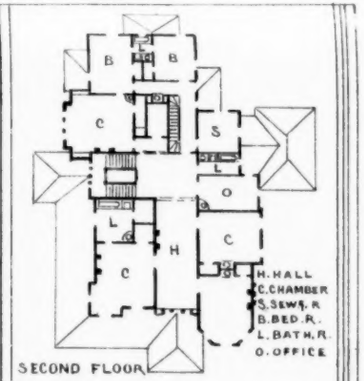
[1] *Town and Country Mansions and Suburban Houses.* With Notes on the Sanitary and Artistic Construction of Houses. Illustrated by thirty Plates, containing Plans, Elevations, Perspectives, and Interior Views of Executed Works in the Queen Anne, Classic, Old English, Adam's Jacobean, Louis XVI., and other Styles. By William Young, Architect, Author of Picturesque Architectural Studies, Spon's Architects' and Builders' Pocket-Book, etc. London and New York: E. & F. N. Spon. 1879.

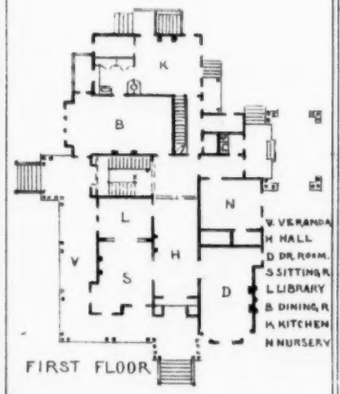
CORRESPONDENCE.

THE SITUATION OF CONSTANTINOPLE. — STA. SOPHIA. — ITS SUCCESSORS AND IMITATORS. — MODERN BUILDINGS. — FOUNTAINS.

Constantinople, April.

In spite of the natural beauties of an incomparable situation, Constantinople stirred in me a constant feeling of dissatisfaction. I could not escape from the idea that I was looking at it from the rear, and this idea, beginning with my first impression, was curiously carried out by subsequent examination. As we steamed up the Sea of Marmora the first view through the early morning haze justified all expectations. A great and beautiful city seemed to rise out of the calm waters like a cloud-castle on the horizon. Nearer yet, and from redoubtable mediæval towers in the foreground stretched sea-walls and





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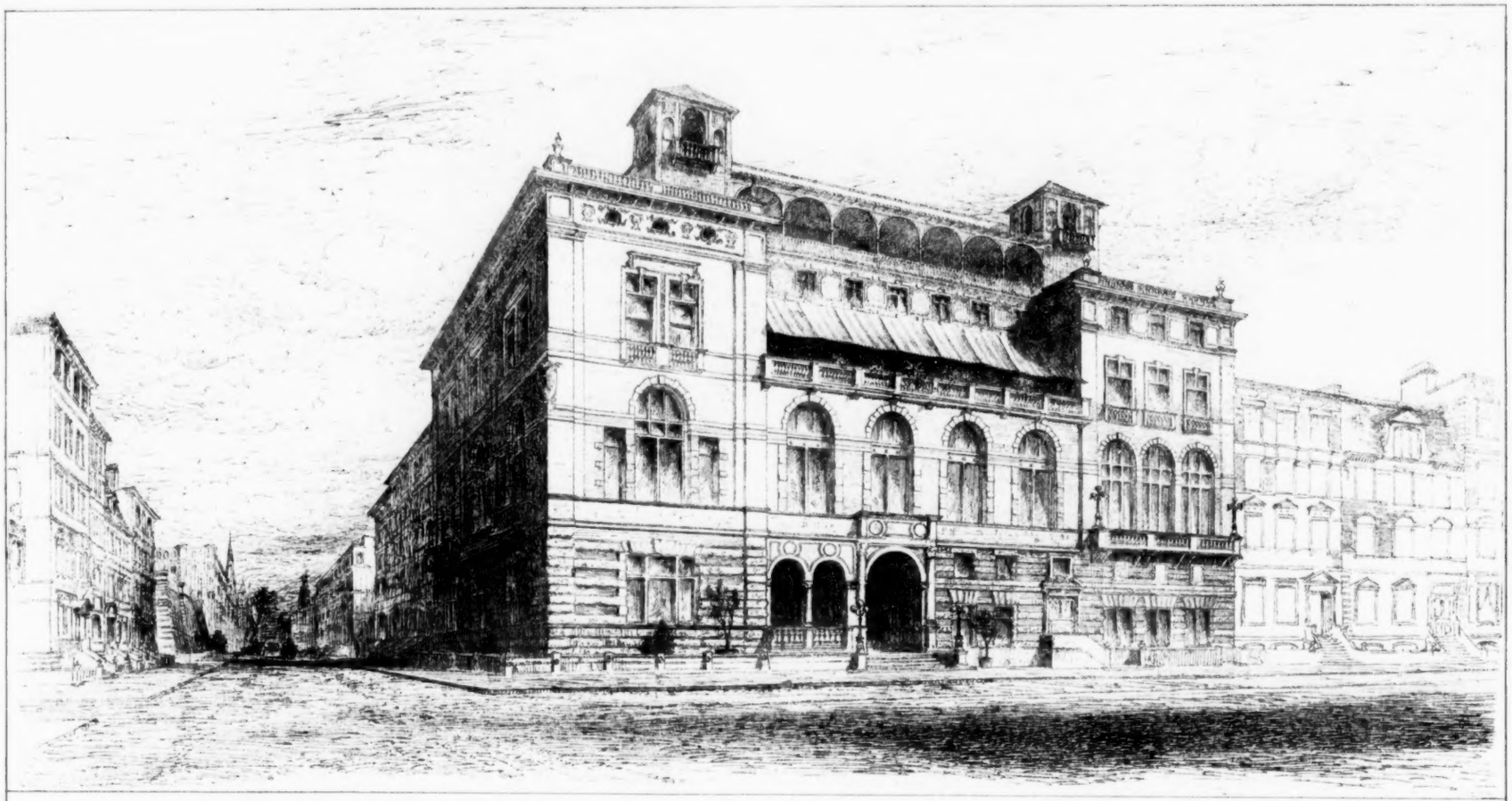
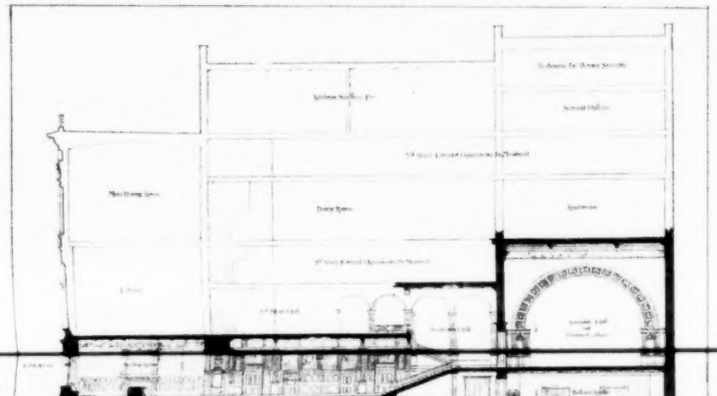
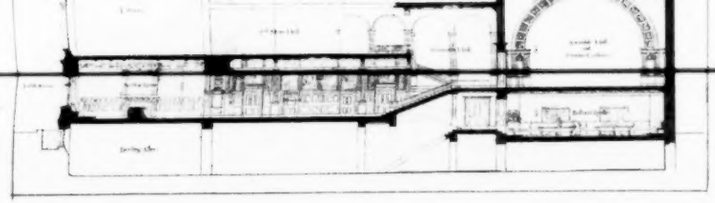
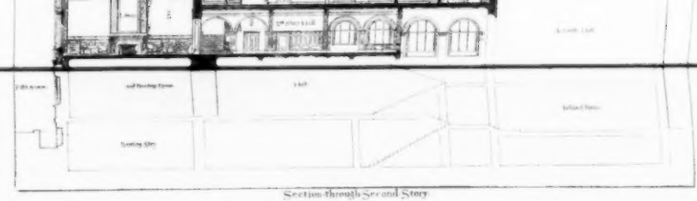
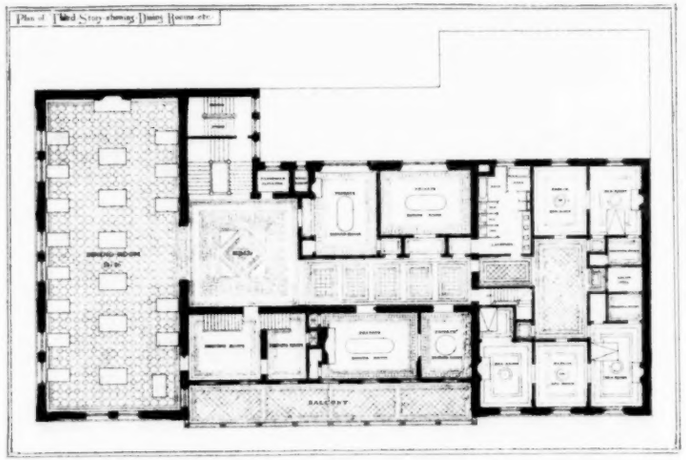


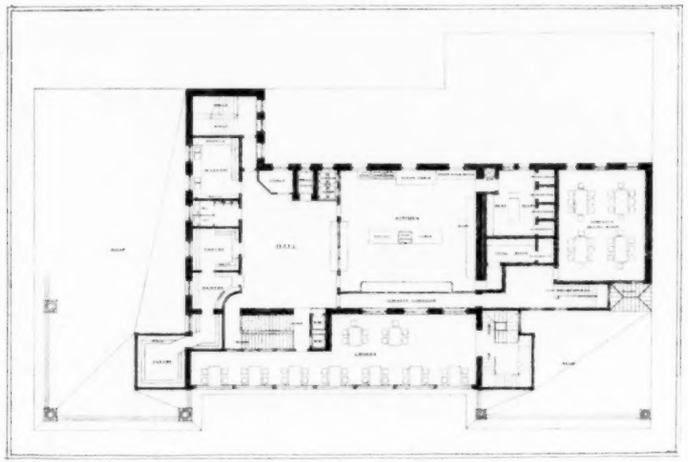


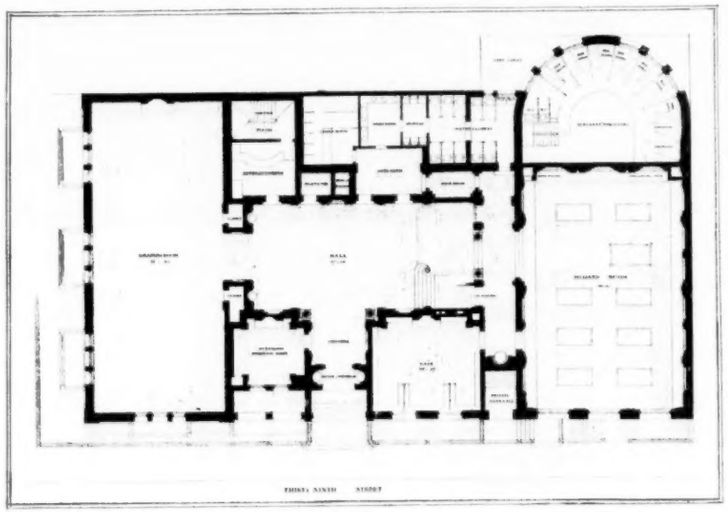




Section through Second Story







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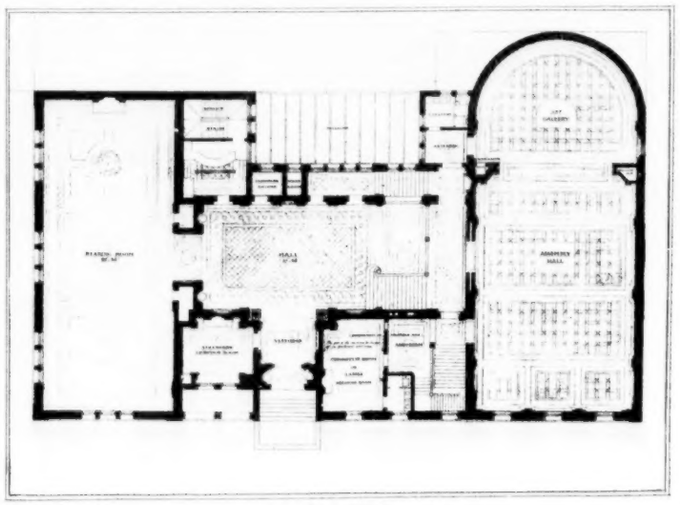

First Story

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DESIGN FOR UNION LEAGUE CLUB-HOUSE NEW YORK

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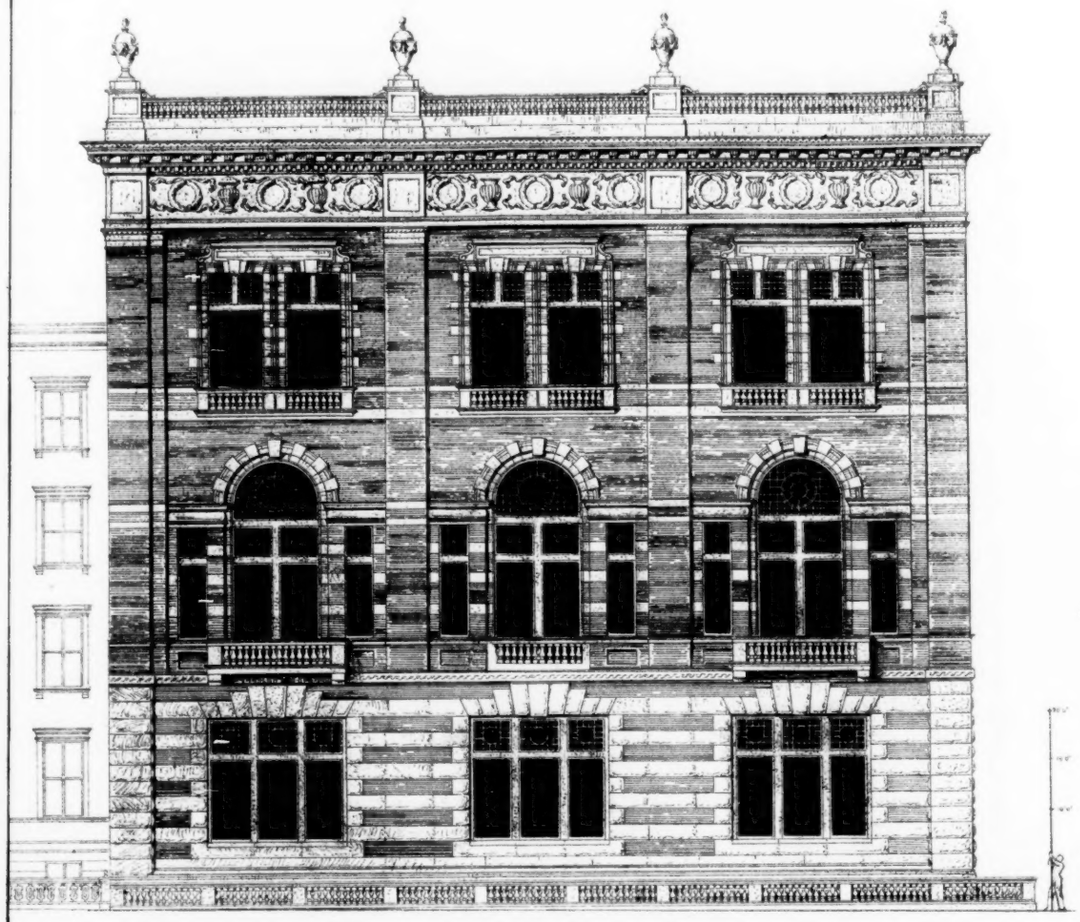
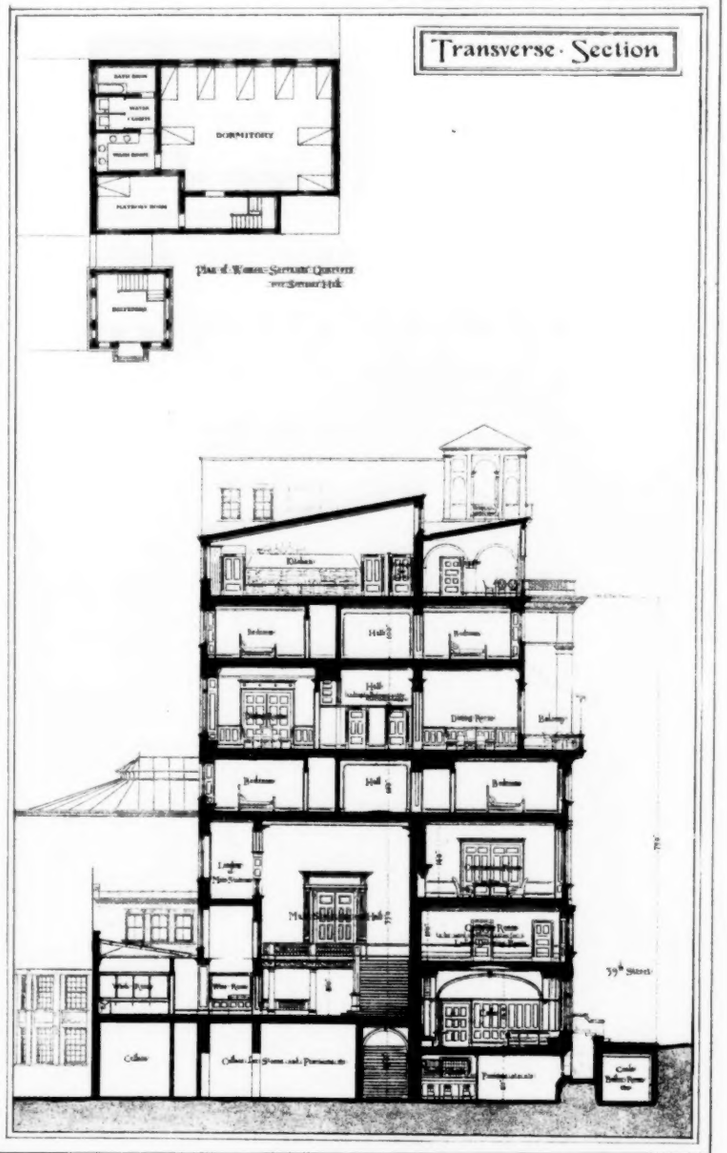
Elevation on Fifth Ave.



Transverse Section



DESIGN FOR UNION LEAGUE CLUB-HOUSE NEW YORK

Mc KIM, MEAD & BIGELOW, ARCHTS.

THE HELIOTYPE PRINTING Co. 220 DEVONSHIRE ST BOSTON

houses off to heights with terrace upon terrace of brown roofs; out of these, here and there, rose huge flat-domed piles with slender white minarets. As we drew nearer the city seemed strangely inanimate,— no boats nor people by the water's edge; no sign of life from the houses; no sails were visible before or behind us. This magnificent situation, looking over the broad sea to the Princes' Islands, is really the rear of the peninsula of Stamboul, as we discovered when a few minutes later we rounded the point and dropped anchor in the Golden Horn. Here there certainly was no lack of life in the busy port, crossed by two ever-crowded pontoon bridges. Beyond these the shores curve inland and narrow up to the "Sweet Waters of Europe." On either side of us, directly from the water, rise steep heights crowded with buildings. On the Stamboul side the great mosques loom grandly up against the sky, while opposite from Galata — the European quarter — the huge old Genoese tower stands boldly out. Behind us flows the Bosphorus between river-like banks dotted with villages and palaces. Neither Genoa with her amphitheatre of palaces, nor Naples set in her lovely landscape, can offer such varied elements of beauty. A closer view, however, does not confirm the promise of this effect. Instead of terraces of stately marble buildings as at Genoa, huddled upon the banks of the Golden Horn is a mass of miserable little wooden houses painted in red and brown ochres. A few modern European stone buildings overtop them, but only look bald by the contrast. One feels that he may be in the rear of the city, and that the real fronts face the other way. But once on shore a climb up through the steep half-paved lanes proves that the best has been already shown, and that the reverse of the medal is worse. In vain have the wealthy bankers and the European embassies remonstrated and even offered to take the whole charge of that quarter of the city; there are too many pachas whose purses are replenished from these "jobs" to allow any such innovation; so the narrow, steep lanes continue, except two or three chief ones, quite impassable for carriages and almost so for pedestrians, — ladies often being unable to stir out of doors for a week at a time in rainy weather. Improvements would be the easier since continual fires sweep through this tinder-box city, only, however, to make way for the same little two-story wooden dwellings. As in some far-away cities I know of, the fire department is vigilant, and a fire is instantly signalled from watch-towers to other parts of the city, and help — though not relief — is quickly on the spot, but the fire-god snaps his fingers and works his will.

It is impossible to pass the rickety bridge across the harbor on the way to see Sta. Sophia, without learning the one great lesson of Turkish architecture — the value of a grand and simple outline for great monuments; a consideration to which details of ornament bear the relation of a lichen to the mountain crag. Neither the mighty effort of St. Peter's dome nor the elaborate height of any Gothic spire has so spontaneously impressed me, as the unconscious dignity of these mosques. Rising in pyramidal masses from the heights of Stamboul, the majesty of the central dome, lifted upon a cluster of smaller cupolas, is incomparable; yet that noble composition is the simplest expression of the plan. Except a crescent upon the dome, there is often not an architectural ornament or moulding from cupola to base; nothing but lead-roofed domes and square walls, pierced with a few small window openings, and prolonged at the corners into square lead-capped piers. It is not the absence of any exterior decoration — much less their neglected appearance — which is to be admired, but the courage which, forced by economy or, perhaps, by an æsthetic reason, confidently leaves unornamented the bald construction in the great central features, whose masses and proportions by themselves cannot fail to be impressive. Those parts which on the contrary can make no such claim are enriched and beautified. Thus the minarets, which stand clear of the central mass and generally rise from the corners of the areaded court preceding the mosque, have their slender height carefully broken by the most richly carved balconies, and the shafts finely channelled or panelled. This court, too, has often a rich cornice, and nearly always very rich stalactite door-ways and, within, a fine arcade. In all general views, however, these last features are hidden by the houses, and only the great central mass rises above them bare and bald, — but always impressive.

The exterior of Sta. Sophia is so extremely bare that it is probable that during the troubled years which succeeded Justinian's reign his successors had neither time nor money to complete and bring it into harmony with the sumptuous magnificence of the interior. It certainly has nothing to commend it but its conspicuous size, and the bold expression of its interior. Its flat dome is still more depressed by the girdle of buttresses at its base between the windows, and as this dome is placed directly upon the square walls, the result is a high-shouldered look. Had the corners of the square been chamfered off in some way I believe the effect of the flat dome would by no means have been bad. The crowning disfigurement, however, lies in the enormous rectangular buttresses, seventy-five feet long by twenty-five wide, which reach almost to the springing of the dome on the north and south side. So enormous are these that at first sight they seem more like buildings than piers. The four minarets are probably the oldest in Constantinople, and certainly the ugliest. Excepting a large tomb chapel near one end, there is nothing in this vast mass of buildings which has the appearance of being finished. It is not surprising, then, that the Turks, in adopting the general features of the church, have built mosques whose exteriors surpass it. The general plan of Sta. Sophia is familiar to all architects. A large but uninteresting Turkish court precedes the original narthex, which is two hundred and five feet long by twenty-six wide; the great nave, or rather hall, with its central and two semi-domes, measures two hundred and fifty by one hundred feet, and is one hundred and eighty feet high; the aisles on either hand add a total width of two hundred and thirty-five feet. It was with a feeling of disappointment at the disordered mass of the exterior that I entered the narthex. Here, indeed, was something worth seeing: the grand vestibule full of rich color gleaming in dim gold from the vault, and reflecting from the rich panels of the marble walls; but I was impatient, and squeezed under the heavy *portière* into the main building. A gasp of surprise — a long breath of swift exhilaration at the brilliant airy space before me. Just below the soaring dome a flood of equal light pervaded the wide atmosphere. No piers nor arches baffled the sight. Freely the eye ranged around and above through the unbroken space. There was an elating sense of freedom and aspiration in this width of pure bright air beneath the lightly poised domes. No preoccupation of constructive difficulties fretted the mind. The means were forgotten in the perfected result. A calm was over all.

Words cannot convey the singular dilation of the senses which I felt, and later remarked in others on their entrance under this wonderful vault. It was a feeling very unlike the sense of littleness with which one creeps insect-like over the floor of St. Peter's, and wonders coldly at its dome as at a giant sepulchre. But here one is spontaneously lifted into a quick sympathy with this grand temple, raised while the Christian religion was yet young in purity and power. Later the same religion built its faith into the intricate beauty of the Gothic cathedral; but in the very beauty of those shadowy aisles, and in the mysteries of its chapels, is there not the taint of darkening superstition? Thus, under the black wing of the Inquisition, Spain built churches into which the light of Heaven hardly penetrates more than into the rayless chambers of Egyptian temples. Then, too, when mediæval superstition was driven out before the revival of learning of the Renaissance, its art, like its philosophies, was pagan. Where then can we look for the pure Christian architecture but in this wonderful church, which Christians have never appreciated, leaving its beauties to be imitated by Mohammedans.

Fine as the first impression is, closer examination only confirms it. Looking from the front entrance towards the apse, on either hand the wall enclosed by the great arch, which supports the dome, is pierced by an arcade of four large marble columns, and above them by six smaller arches. Through these there is a glimpse of the gold mosaics of the aisle vaults; but the eye does not rest there, being carried along to the central niche of the apse, which has two ranges of three windows, and above, in the *conque*, five smaller ones. On each side of this niche others of equal size open with arcades into the side aisles. Just as the windows are carefully designed to give scale to these three niches, so the latter in turn mark the size of the immense half-dome which encloses them, and rises to support the central dome. The opposite end (the front) has a similar disposition. The sides have, beside the two stories of galleries already mentioned, two more stories of windows. Thus, on all sides, from the delicate incised carvings of the capitals and inlaid arabesque on the walls, there is a constant gauge of scale, and a perfect progression from the finest details, gradually but surely up to the great central dome. This is really but little less than a hemisphere, but looks flatter, which gives this uncommon advantage, that, whereas the eye is carried surely up to it as the crowning glory of the structure, the eye as easily descends, and is not, as is generally the case with Renaissance churches, attracted up into the dome and its lantern, and there hopelessly imprisoned, so that it is by an effort that the attention is brought back to the body of the church. The beautiful Byzantine carvings, the marbles and mosaics, which in themselves form a museum, I have not space to describe. The finest mosaics visible are in the splendid galleries over the aisles; the others have been painted over by the Turks, but on gazing up into the apse one becomes aware, with awe, of a mighty form, which, like a shadow, lies upon the vault. It is the great Byzantine mosaic of our Saviour, which asserts itself through the covering with which the Turks have thought to hide it. Here and there also in certain lights dim forms of early saints appear, spirit-like, under the later decoration. Let us hope that these long-suffering martyrs may soon see the light, and that Christendom has at last nearly exhausted its patience, — or indifference, — and will soon reclaim the earliest of its great churches.

Although the Turks set Sta. Sophia before themselves as their type of mosque, they missed some of its essential beauties as completely as did Mahomet those of the Christian faith in his attempt to remodel it. They were not wrong in seeking a greater regularity than the disordered exterior of their prototype, but their attempt to improve the plan by reducing it to a symmetrical figure eliminated all poetry from the design. One of the wonders of Sta. Sophia is the skill with which the grand simplicity of a dome over a square plan is combined with the advantages of a lateral distribution to concentrate the interest at the end of the building. But the efforts of the Turks have been to reduce this plan to a square, with similar motives for each side. Thus their typical mosque plan is a central dome — less depressed than that of Sta. Sophia — resting upon four great piers; half-domes opening from each side are brought down by niches or pendentives upon an outer wall, enclosing the central

square at a distance of half its width, and the small squares thus formed between the piers and the walls are covered with cupolas. Such a plan certainly gives a very monumental exterior, and the first effect on entering this huge vaulted square is impressive, but the eye, finding the same aspect on all sides, is soon wearied. Were the dome richly and variously decorated, this repetition of motive would be satisfactory in giving value to the painting, but the mosque interiors here are without anything which can be called mural ornament — often merely whitewashed. Add to this that the fourteen great mosques have nearly the same dimensions, and it will be understood that they disappoint the interest promised by their impressive exteriors. The mosque which is most worthy to be compared with the great Byzantine example is that which Suleiman the Magnificent built in the middle of the sixteenth century. Although here, too, the plan is nearly square (being two hundred and twenty-five by two hundred and five feet externally), the disposition of Sta. Sophia has been in so far imitated that only the front and rear walls are opened for apses; the great lateral arches enclose a wall pierced with windows and a triple arcade opening into the aisles. Here the chief defect I noticed at Sta. Sophia is remedied, for in the latter the curtain walls under the lateral arches are placed too nearly flush with the inner face of the arch, which within is thus deprived of its aspect of solidity, and gives an awkwardly deep exterior reveal. Though there is nothing beside its noble proportions, two or three fine glass windows, and four ancient monolith columns, this interior is certainly admirable. A curious example of the scriptural exhortation to "lend unto the Lord" may be seen here, for the galleries are piled with boxes of valuables placed there for safe-keeping. The mosque is preceded by a handsome arcaded court which is fast going to ruin, for the Government, though having appropriated the chief endowments of the mosques with a promise of keeping them in repair, really does nothing for them. In the rear is a garden with an octagonal tomb-chapel of the founder. The latter represents a type of structure, called turbehs, found connected with all the large mosques. They are nearly all octagonal, and some of them support their vaults quite independently of the outside wall, upon columns standing some three feet from it. The tomb in question is interesting in showing that if the Turks chose, or were forced by bad building materials, to have no ornaments on the outside of the mosques, they were ready and skilful in lavishing it upon their tombs, which are rich in tiles and inlaid work. The whole exterior and interior of the Suleimanyeh may be taken as the finest example of Turkish architecture, and I believe is not inferior to any building in the world in monumental qualities. Besides these two, there are twenty-four imperial mosques, and about two hundred and twenty built by persons of inferior rank. There are also some three hundred chapels. As I have before said, the plans of these mosques are almost identical, and they have little or no decoration, which is some consolation for the fanaticism which will not allow Christians to enter — much less draw in — many of them. There is an immense difference between the Turks' arrogant hatred of Christians and the distrust with which the Arabs regard us. In Cairo, once armed with a government permission, I found no difficulty in working as I liked in the mosques, but here a permission from the Porte can be obtained to visit only the four principal ones, and that only on paying large bakshish, and one has to be accompanied for safety by a policeman. Several of the largest mosques have, therefore, never been measured.

The Turks have little to show which justifies in our generation their traditions as a race of builders. In abandoning Eastern art for the Renaissance, they succeed about as well as do the Orientals when adopting suddenly Western customs (as Japan is now doing). The Sultan's extravagant new palaces are flimsy and vulgar, and need no mention. There is, however, a small mosque at Ortakeui, lately built, which, besides being a clever adaptation of florid Renaissance to the square domical mosque, has two of the most delicate and slender minarets imaginable. They stand white against the dark hill-side, like flower stems, and it seems almost incredible that they have space for the staircases. This was probably designed by a Frenchman; in fact nearly all the architecture is in the hands of Europeans, — and they have generally no reason to be proud of it. Although the Turks have built perhaps greater monuments than either the Arabs or the Persians, they are far less in purely an artistic sense, and it is to these two nations that all their decoration may be traced. From — perhaps by — the Arabs come the stalactite work in the mosques, while to Persia is due their flower and scroll patterns. The latter are seen to great advantage in the numerous fountains. These, though ungainly in form, offer large surfaces for decoration in tiles and gilding. The detached fountains generally are rectangular, often with rounded corners, and contain a chamber for the distributer of the water, who standing within fills the metal cups and passes them through the railed windows to the people. Immensely projecting eaves and small domes give a picturesque effect, but their beauty lies in the ornaments, which are richly and carefully designed with running patterns of vine and leaf; or in panels are often carved in slight relief vases of flowers. Marble reliefs are often picked out with gold and stone carvings painted; Persian tiles add their beautiful colors also. Even the commonest street taps have some decoration of this kind, which we should find appropriate for our drinking fountains.

Of the many examples of Byzantine churches in this city the greater number are used as mosques, and are inaccessible. The church of the monastery of Chora, built during the reign of the Emperor Alexis Commonus — now the mosque of Kahrièh Jamisi — is of great interest. It has a central dome and two side cupolas, a narthex and an exonarthex. The latter are covered with mosaics, which though late in date are of wonderful workmanship and of exquisite coloring; quite as fine as any of the same date in Italy. It is to be hoped that the whitewash of the central dome conceals equally fine ones.

All the European powers have large embassies; while we have none, but on sailing up the Bosphorus, our flag may be seen waving above a true "American mansard" roof. Ugly as it is, we may well be proud of our countryman to whose generosity is due this fine institution. Robert College, founded in 1863, gives the best instruction to two hundred students, and cannot fail to be a power in this land of ignorant prejudices.

R.

SLOW-BURNING CONSTRUCTION.

Brookline, May 26, 1879.

To the Editor of the American Architect:

Dear Sir, — I am under great obligation to your correspondent C. for the kind manner in which he has replied to my last communication, and I greatly regret if I have appeared to do an injustice to the members of a profession among whom I count many of my best friends. We agree in the main in regard to the unsafe character of many of the city structures, but I cannot admit as yet that the "knowledge of the simplicity of the means by which comparative security can be attained" is attained more surely by the professional architect than by the non-professional underwriter. I say this with all respect to C., because the very title with which he heads his rejoinder proves that he has missed the point of my first letter. I have not raised the question "why buildings are not made fire-proof," because I am well aware that the cost would be too great for common uses, and that either the architect, builder, or mill engineer who proposed such a construction for ordinary buildings would fail to get much employment.

Our mills are not fire-proof, but if kept clean and in good order they are *slow-burning*. The contents may burn with great rapidity, but the structures themselves are built with a view to slow combustion.

The underwriters claim that the same quantity of material commonly used in the construction of a city warehouse, school-house, or church, and usually put together in such manner as to make a very combustible structure, can be so combined as to make a very incombustible one, at the same time not more expensive, and in many cases more fit for use, than the ones now built.

The dwelling-house constitutes a more difficult problem because of the numerous partitions, but even here we think a truly skilful architect could get some useful hints from the factory methods.

The city structures to which we take exception are many of them those in which money has not been spared, and where owners, architects, and builders appear to have desired to compass safety; yet in such buildings we find faults which our experience has taught us to be grave causes of danger. It would not be fit for me to designate the exact buildings, lest I should do harm to some individual; but I have now in mind one in which the intention has been to secure complete safety, as nearly as possible, short of an absolutely fire-proof construction, yet its flat roof and the inside finish of its upper story are so combined as to make it dangerous. It could not be insured by the mutual underwriters, even if alongside a factory fire-pump, without a considerable alteration, or a heavy expense for sprinklers in the hollow spaces between its flat roof and its false ceiling; in which concealed and inaccessible space enough wood has been uselessly placed to assure a very great damage and probably complete destruction of its upper stories if fire ever gets there. Rats may set it on fire at any time if oily rags, such as are often used in cleaning furniture or wood-work, should happen to come within their reach. We have several proved cases where rats have caused spontaneous combustion by building their nests of oily waste in such hollow roof-spaces as I have described.

In other buildings, not far from your office, faults of the most serious kind can be pointed out that would have been remedied at even less cost than has been incurred; in other cases, a little of the money spent in excessive exterior decoration, if expended in the interior, would have made the buildings far safer and better for use.

I am well aware of the difficulty which architects often meet when suggesting changes in method, but it is not always so, and I cannot but think that the great attention that has been given to architectural effect and to decorative art has been, in part at least, misapplied, and that it is because of this tendency to develop unduly the fine-art side of the profession that the architect has been so little consulted by those who must of necessity be controlled by the uses to which the building must be put.

During the last ten days the writer has visited one new factory, not yet occupied, for which a professional architect was employed to prepare the plans. It is safely built, but it is greatly injured for use because the arrangement of its windows and the construction of its roof have been subordinated to the architectural effect. It has an unusually good effect, but its owner will pay a heavy annual tax for its enjoyment.

In the same week he has received a report of the last winter's use of a factory building planned by Mr. W. B. B. Whiting, one of the officials of the Mutual Insurance Company, of which he is president.

In reference to the building the report is that, compared to one formerly used for the same purpose, "the saving in gas alone during the winter has paid the interest on the cost of the building." This structure is about one acre in extent, one story high, the roof is so constructed as to be perfectly safe as to fire, and yet the amount of steam coils required for heating is no greater than in a compact building four stories high. It is built of brick with corner towers; the shafting is in the basement; it contains about a thousand gingham looms; its size is about 136 by 330 feet; and it cost a little over $23,000, say fifty cents per square foot of floor surface. The owners are about to build another building, on the same plan, of about the same size, and expect to finish it for less cost than the first one.

Underwriters greatly prefer one-story buildings, and their advantage is now being admitted, not only in respect to safety, but also in convenience and in the higher speed at which machinery can be operated without increasing repairs. In the building above referred to, the looms have been driven at twelve per cent higher speed than they were on the second floor of the old mill, now used for carding and spinning, and the repairs and imperfect work are less.

For the satisfaction of the profession the writer is glad to add that he also lately visited another great factory where the owners are so well convinced of the bad and unprofitable effect of confining the operatives to large, dreary rows of barn-like wooden houses, that they have purchased a large lot of land and are about to employ a professional architect to lay it out and cover it with cottages, the architect having already proved his capacity to produce good effect by simple and inexpensive designs in plain brick.

The question at issue in this discussion is one of grave importance. The annual loss by fires in the United States is $80,000,000 to $100,000,000, and the incidental expenses of sustaining insurance companies and fire departments amount to $50,000,000 more. This fire tax of not less than $130,000,000 a year is the heaviest single tax that is imposed on this nation.

I now beg to submit for criticism by your professional readers a description of a school-house built on the ordinary method, and of a mill built according to our rules. This description had been prepared as a part of a preface to a little text-book we are making for the use of our members. If my description does not apply with tolerable accuracy to the greater part of the school-houses of this vicinity I beg to be corrected.

"If the requirements of a factory and a school-house be compared, the conditions to be met are not very unlike, except that the factory must bear more dead weight. There must be, in both, light, air, ready means of escape, a kind of finish that will bear hard usage, and the least waste of room.

"The brick walls of the factory would be hollow, and would be finished upon the brickwork, with no inside air-space and no furring or lath and plaster; the beams would be in two parts bolted together; the floor would be of two-and-a-half or three-inch plank, with a one-inch top floor; there would be no ceiling on the beams, but the whole construction would be open; the roof would be of the same construction as the floor, with a slight pitch, — this is a very essential point. The towers would be without any well-hole in the stairway, and so constructed that if a cask of water at the top be tapped, the water will flow to the bottom before it can escape. The windows would be cut to the top of each room, to give the maximum of light and air. If division-walls were necessary, they would be either of brick, solid, or of wire lath and plaster, which is now put on in such way as to cut off any passage of fire, even on the studs to which the wire lath is fastened; but we often require partitions even when plastered to be of solid plank. The cellar ceiling around the heating apparatus would be lathed with wire lath and plastered upon the under side of the floor plank and on the outside of each beam, leaving no air or open space behind the plaster, but following the line of the plank and of the beam.

"No decoration is required in the factory, but only the utmost of light, which may be secured in part by using whitewash and not paint; but such a building is capable of very tasteful decoration in solid panel-work between the beams and by the use of color upon the walls. It would meet the rule of true decoration that it would exhibit no sham.

"The school-house, built according to the prevailing method of combustible construction, would have a lower floor of ordinary plank, set twelve or fourteen inches on centres, and braced with wood, unprotected by wire lath and liable to take fire from contact with steam pipe, as lately happened in New York. Above the cellar the sheathing or plaster finish would be furred off from the other wall and from the division-walls even when they are of brick; the hollow space left between the walls and lathing in which fire or vermin may circulate freely would be connected with similar spaces in the partitions between the rooms; these again would be connected with the spaces between the floors and the ceilings, and the whole arrangement, apparently devised for the purpose of carrying a fire from the cellar to the attic, would there be connected with a large space between the roof and the false ceiling hung by wooden connections from the roof plank. In most instances there would be a large collection of chips and shavings between the floors and ceilings, left there during the process of construction. The roof would be covered with boards, subject to be quickly burned through, in place of thick plank, and this draft throughout the concealed spaces where the fire would be completely protected from water would burn most rapidly at the most inaccessible point, namely, the space between the false ceiling of the upper story and the roof. The stairway, if in a tower, would have a large open well-hole; the top of the windows would fail to reach the ceilings by two to three feet. The decoration of this building, if attempted at all, would be stucco or varnished wood, — the one a sham, the other a cause of danger.

"The construction of the factory assures the minimum of loss from the unavoidable fires that occur in the conduct of the business.

"The construction of the school-house renders the occurrence of avoidable fires very probable, and assures the maximum of loss and danger from the minimum of fire. The same false method of construction is the principal cause of the heavy and increasing losses by fire in stone churches, brick and stone warehouses, and other buildings which are exposed to no special hazard whatever.

"There is no common practice without some marked exceptions, and the writer can point to three warehouses, one bank building, and one school-house and several churches in Boston, that are built on the slow-burning or incombustible method; also to one dwelling-house in the vicinity. There are probably many more; but this comprises the number that he has happened to see in the course of his walks about the city, his attention having been given to this subject very many years since, owing to his connection with insurance companies as a director.

"The attention of the owners of property cannot be too quickly given to these subjects, and it behooves architects and builders to study industrial architecture in order to insure a remedy for the terrible burden of the fire tax. It is the conviction of the managers of the mutual insurance companies that such a remedy can be found without involving any extra cost in the construction of buildings intended to be of the better class, such as constitute the new buildings in the burnt district of Boston."

In your own remarks, Mr. Editor, on my first letter, you hesitated to call for designs and specifications for a factory as suggested by me, on the ground that it was asking too much work.

I think you are mistaken; a sketch of an upper story, roof, cornice, and floor, with a sectional plan and a design for a tower drawn with a pen in heliotype ink, such sketches as a good draughtsman could make in a couple of hours, would fully show whether the plan was one that a mill owner could safely adopt or not.

In reply to the proposition made by C. as to the writer's probable course were he called upon to build a hotel, he begs to say that he probably would not attempt an absolutely fire-proof construction, but that he would endeavor to apply the principles of slow combustion, and would also endeavor to build in such a way that the rats in their passage from the cellar to the attic in the concealed flues in the wood-work should not wake him up by stirring the shavings and rubbish over which they travelled, an occurrence which has not been infrequent in some hotels that might be named, and one which probably accounts for the fact that hotels stand at the head of the list in the enumeration of fires. E. A.

[Concerning a call for designs and specifications for a factory, E. A. falls into an error which is common among clients who do not understand the nature of an architect's work. The sketches of upper story, roof, cornice and floor with sectional plan (meaning, of course, section), and design for a tower might be prepared by a good draughtsman, not in a couple of hours, but in a day or two perhaps, provided the architect who offered them had been intrusted by any mill-owners to prepare plans for a mill. These things, however, by no means meet E. A.'s call for sketches and specifications showing all the construction and material of a mill four stories high. But the real cost to an architect is not the mere draughtsman's work in recording his design. This is often a mere drop in the bucket. The cost is in his own time and labor spent in forming his conception and bringing it into definite shape, in directing and overseeing his draughtsmen, and verifying their work. If an architect had once been intrusted by some mill-owner with the planning of a mill, he might have plans ready in such shape that a draughtsman need only make transcripts from them; but this is, in the showing of our correspondent, not to be expected, and in any other case he must spend a considerable time in careful study before he could set his draughtsman at work. We shall be glad to receive any designs for mills with which architects may be willing to favor us; but if E. A. has time to read what we have had occasion to say on competitions in the first part of this paper he may see that our opinions of competitions do not warrant us in lightly appealing to the aid of architects, or in looking for any great response to demands upon them.

We may leave it to C. to discuss the other points in E. A.'s letter, since it is to his remarks that they are chiefly directed, only stopping to say that we do not think that the methods of mill building could be applied to any of the buildings which our correspondent mentions, except the plainest of warehouses, without increasing their cost, unless at the expense of a homeliness that would not be tolerated. There is really nothing so cheap as lath and plaster, to put solid material behind it adds to its cost, and to sheathe plank or timber tightly in it is almost to insure dry rot. Moreover, in dwelling-houses, school-houses, and hotels, the wide spaces behind the framing, in the floors and partitions, and under the roofs, are essential for checking the conduction of heat and noise, unless more expensive means are substituted. These spaces may be so subdivided and interrupted as to make them much less dangerous, but even this costs more than most clients would be willing to consider. A house or hotel built on the mill plan would be almost untenantable. To pass a hot night in a barn chamber, or in a plank-built Swiss hotel on a frequented pass, is a convincing argument. — EDS. AM. ARCHITECT.]

NOTES OF EXPERIENCE AND INEXPERIENCE.

24. WEATHER STRIP. — Can any one tell me how to get a certain device for keeping the weather out under front doors, and consisting of a brass plate, hinged at the ends, which drops down flat into a sinkage in the sill of the door when the door is open, and on closing the door, is raised by a kind of finger on the bottom of the door, into a groove made to receive it. I believe they are made in Connecticut. T. M. C.

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23. STAMPED PATTERNS. — I would suggest to "Queen Anne" to draw her pattern on a board one quarter inch thick, and to have it cut out with a jig saw, and then, before the last coat of plaster becomes dry and hard, to lay the pattern against it and scrape the plaster through the cuts with a small chisel. The last coat of plaster should not be more than one quarter inch thick, and the coat under should be set pretty well before applying the last coat; this method I have used successfully — the arrises are sharp.

W.

NOTES AND CLIPPINGS.

Building in Denver, Col. — We have received a letter from the architect who sent us the report of the building outlook in Denver which called forth the response of H., in our issue for May 3, 1879. Our correspondent states that he is not, as H. supposes, a new-comer, but has seen more than half of the city grow up about him, and during this time he has kept a diary which shows that, taking one year with another, in no month is building more active than in the month of March; and that, although last year was a busy one, he has carried on more building in a previous year than any three other architects in the city. He thinks H. may have been misled by the printed reports of the year's work, incorporated in which he himself detected many buildings which were finished the year before, and some two years before.

A Mexican Jacal. — A correspondent of the New York *Evening Post* gives the following description of a class of dwellings common in the neighborhood of Vera Cruz, Mexico: "The dwelling of the Jarocho, variously called *rancho*, *ranchito*, and *jacal*, generally stands in some small open savanna, close to the timber's edge, though not infrequently it is placed in the thick forest itself. Differing slightly in form in the upper tablelands and the lowlands, the same open-air architecture earmarks the individuality of each. It is essentially a summer house, compared to which the latticed pagodas adorning northern door-yards would oftentimes be warmth itself. In fact, to nothing does it often bear greater resemblance than to a monster bird-cage of peeled willow rods, with the interstices between the reeds rather more limited than usual. Place a steep roof over the miniature osier cages in which foreign birds are imported singly, and an almost exact likeness of many *jacals* will be obtained. The corner posts are generally the smooth trunks of the palm. Crossbeams of the same unite the uprights, and are laid as joists across the top of the framework and as rafters for the roof. The walls are made of a species of bamboo cane — plentiful in the lowlands — cut into proper lengths and set closely together, like the upright rods of the bird-cage. The roof, thatched with the fan-shaped fronds of the palm, laid like slates or shingles to turn the rain, projects far beyond the walls, shading the house from the rays of the tropical sun or beating rain. A cane door, a simple framework of upright rods, and swinging on rawhide hinges, affords ingress and egress. Of windows there is no need, the interstices between the bamboos affording all the light required. To keep out the cold, or, more frequently, the dust raised by a norther, a thin matting of plaited palm leaf, rolled up after the manner of a Venetian blind under the projecting eaves, can be let down all around the house. For this, however, there is scant occasion, a cold day being phenomenal in the tropics, and the matting remains rolled up during most of the year. A queer effect is often seen, especially in a newly-built *jacal*, in the growing of the palm logs after they are placed in the dwelling. Broad leaves spring from their freshly-cut ends, until the whole structure seems, like the house built in the bean-stalk, to be slowly growing into the air. The interior furnishings of the *jacal* exhibit the same unique characteristics as the exterior. Generally the house is of one single apartment; occasionally, in the better class, though rarely, there are two apartments. The floor is of earth, stamped or beaten down to the hardness of a brick; the ceiling, the few palm joists laid across the timbers. Usually there is a raised bench or platform on one side of the room upon which the *petate* is spread for the bed, though the hard earthen floor is often deemed sufficient. About the walls hang some small pictures — colored prints of the Virgin, the sacred heart, or Santa Gaudaloupe, the patron saint of Mexico. It may be that the daughter of the house — and there always is a daughter — has come under the influence of a convent for a time and can read, perhaps write, — a miracle of knowledge. In that event there is a copy of the Lives of the Saints on a bracket, and possibly a prayer-book, much abbreviated by frequent demands upon its leaves for cigarette-paper. If the *jacal* has two apartments, a glance into the inner one discloses the beds used by the female occupants. Perhaps it would be better to say bedsteads, they being mere gratings of bamboo canes, split and laid parallel on a frame with short feet, and covered with a piece of *petate*, or palm matting, which does duty as mattress, pillow, springs and all."

Adhesion of Mortar. — In building the Pont de Claix, some experimental blocks were joined by mortar which was allowed to harden for three years, when the mortar was broken by an average load of 10.0125 kilogrammes per square centimetre [142.228 lbs. per square inch]. This experiment seems to show that the adhesion of mortar to stone is only about one third as great as the cohesion of the mortar itself. The result is noteworthy, as this adhesion is the true measure of the resistance of masonry. Further experiments of a similar kind are desirable, in order to establish formal conclusions. — *Annales des Ponts et Chaussées.*

A New Cement. — A valuable cement is described in *Dingler's Polytechnisches Journal*, which consists of a chromium preparation and isinglass. It is made by dissolving chromic acid in water as follows: Crystallized chromic acid, two and a half grammes; water, fifteen grammes; ammonia, fifteen grammes. To this solution about ten drops of sulphuric acid are added, and finally thirty grammes of sulphate of ammonia and four grammes of fine white paper. The isinglass solution is prepared by dissolving isinglass in dilute acetic acid, — one part acid to seven parts water. These two solutions are kept separate till the cement is needed. When used for envelopes, for which the cement seems specially adapted, the chromium preparation is applied to the part under the flap, while the flap itself is moistened with the isinglass solution. The two are then pressed together, and a cement is formed, which is firm and solid, insoluble in hot or cold water, or even steam, and not affected by either acids or alkalies.

A Wood and Asphalt Floor. — A new method of laying a basement or cellar floor has been adopted lately in certain fortifications at Metz, where it is said to give satisfaction. Pieces of oak, three or four inches broad, one inch thick, and one or two feet long, are pressed down into a layer of hot asphalt, about half an inch thick. When the asphalt has hardened, the wood, which, in order to furnish a key to the asphalt, is bevelled on each side, can be planed to a true surface. The wood is usually laid in herring-bone pattern.

Weather-Worn Glass. — Experiments lately made in London on the loss of light caused by imperfect glass in the street lanterns show that the glass usually used causes a loss of nearly fifteen per cent of the illuminating power, while certain samples of the same kind of glass which had been long in use, and whose outer surfaces had consequently been etched, as it were, by exposure to the dust-laden winds of the city streets, showed that as much as 83.81 per cent of illuminating power was lost.

A Curious Accident at Paris. — Towards the end of his reign Napoleon III., being hard pressed for money, confiscated for his own uses the portions of the Luxembourg Gardens at Paris lying on either side of what is now known as the Avenue du Luxembourg, intending to sell the land thus seized for building-lots. His plan miscarried because the authorities declared that the catacombs underlying that section of the city would not support the buildings it was proposed to place over them. An accident which has lately happened in the Passage Gourdon, not far from these gardens, shows how necessary was this prohibition, and shows, too, what traps for the unobserving houses in this quarter may prove to be. A sculptor, M. Marcellin, noticed one day that a horizontal crack, one millimetre wide, had declared itself in a certain bond-stone at the door of his atelier. Being a man of intelligence, as well as observing, he pasted a strip of paper over the crack and waited developments. In the course of a week the paper cracked longitudinally, so that he could no longer doubt that the settling was still going on. He at once called in an architect, M. Huguelin, who lived near at hand, and an inspection of the premises was made at once. So little was any immediate danger suspected that the families of both gentlemen descended into the cellar of M. Marcellin's house, which, by the way, was the middle house of a block of three. M. Huguelin at once detected some dangerous-looking cracks in the cellar vaulting, and as he watched he noticed the stone newel of the stairs sinking before his eyes, while the stone steps were momently becoming more disjointed. Hardly had the frightened watchers reached the door-yard, when a decided settlement took place, the window-glass splintered in every direction, and the whole atelier fell through to the cellar. The upper stories of the house were still supported on the iron floor-beams which were let into the party-walls of its two neighbors, and added the strain of the partly unsupported weight of the upper stories of the wrecked building to the dangers of their uncertain foundation. Temporary shores and props were applied, and then strong scaffolds were built in front of and behind the building, and a long beam was run, with the nicest care, through the building from side to side, for fortunately two windows reaching to the ceiling of the second story chanced to be exactly opposite each other. All work had to be done from the outside, as it was not thought safe that any workmen should enter the building.

The French and English Obelisks. — More than two hundred men and very complicated machinery were required to erect the obelisk of Luxor in the Place de la Concorde at Paris, and this at a cost, including transport, of $300,000. Only twenty-five men and very simple apparatus were used in erecting Cleopatra's Needle upon the Thames embankment. The expenses for the same operations upon Cleopatra's Needle reached only about one fourth of that amount. The following figures give a comparison between the two obelisks: —

	Cleopatra's Needle.	Obelisk of Luxor.
Height,	68.5 ft.	74 9 ft.
Volume,	2528 98 c. ft.	2945.62 c. ft.
Weight,	186 tons.	225.9 tons.

The Strength of Ailantus Timber. — Professor C. S. Sargent says that in experiments made in the dockyard at Toulon, France, where the wood of the ailantus has been tested as to its resistance to strain and compression in comparison with the wood of the European oak and elm, the average of seven trials showed that the ailantus timber broke under a weight of 72,186 pounds, while elm timber yielded to 54,707 pounds, and that oak timber would endure but 43,434 pounds. It is not yet shown satisfactorily how the ailantus will resist exposure to water and atmospheric influences, but the indications seem very encouraging. For interior work and for cabinet-making the wood is peculiarly adapted, as it works freely, seasons readily, and is the equal of mahogany in its freedom from warping and shrinking. For floors and stair-treads its lasting qualities are unsurpassed.

Kaolin. — A valuable bed of kaolin has been discovered two miles from Bloomsbury, N. J. The earth is of the finest quality, and the deposit is large.

Bell Metal. — A superior bell, according to Kirke, requires the proportion of 144 pounds copper, 53 pounds tin, and three pounds iron. Iron, copper, and tin do not unite well, if each is added separately to the other; but if tin-plate scraps are melted in a crucible together with tin, and then this tin and iron alloy added to the molten copper, it will unite readily. Another alloy that is highly recommended is composed of 53.5 parts copper, 6.11 parts tin, 2.13 parts lead, and 3.9 parts zinc, this alloy having a good, sonorous sound, even if the mould is not thoroughly dry. The silver bells of Rouen, France, consist of 40 pounds of copper, 5 of tin, 3 of zinc, and 2 of lead.

A Clerical Jack-of-All-Trades. — An English vicar at Carlton-in-Cleveland, Rev. George Sanger, has sent to the members of his parish the following circular, which has been called forth apparently by complaints of his action in restoring a parish church: "I feel sorry for the necessity of a letter to vindicate my conduct in rebuilding the parish church, which became so dangerous after last August gales that service could no longer safely be conducted under its roof. If I had not taken upon myself the rebuilding, the burden would have fallen upon the parish. You must all be aware that I have worked as few clergymen ever yet worked to rebuild church. I worked as a bookbinder, for two years, to get money; obtained the subscriptions, writing upwards of two thousand letters; designed the building, acted as clerk of works and contractor; carved all the wood and stone, and worked with the men employed; and I ought to be allowed to complete the work in peace and not be publicly insulted for the benefit I have conferred upon the parish in building a church which for elegance is second to none in its locality."